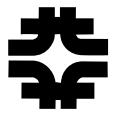


Tevatron Low-Beta Optics Measurements and Upgrade Plans

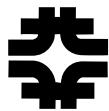
Alexander Valishev, Tevatron Department

All Experimenters' Meeting, Dec. 4, 2006



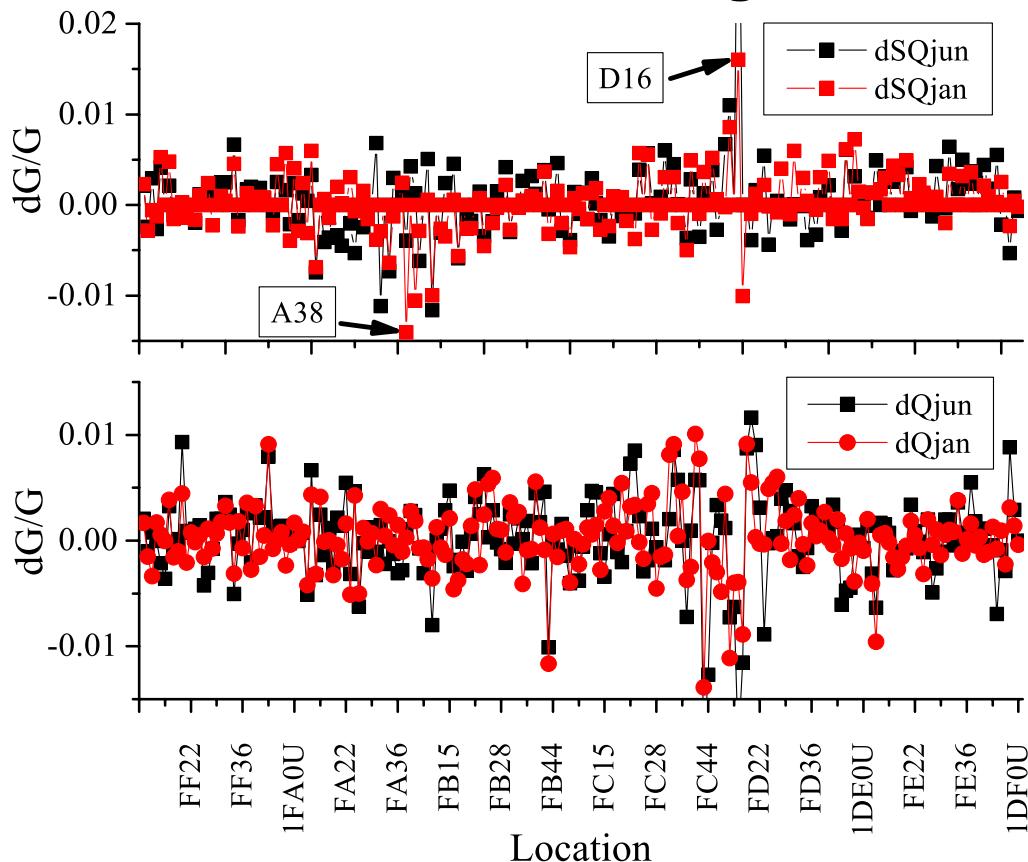
Contents

- Orbit Response Matrix measurements after 06 shutdown, β^* values
- Beam-beam effects and luminosity evolution analysis
- Second order chromaticity correction
- Prospects



ORM Measurements After 06 Shutdown

- Two measurements, 6/6 and 10/24
- No significant changes compared to pre-shutdown
- Vertical β^* is larger at both experiments

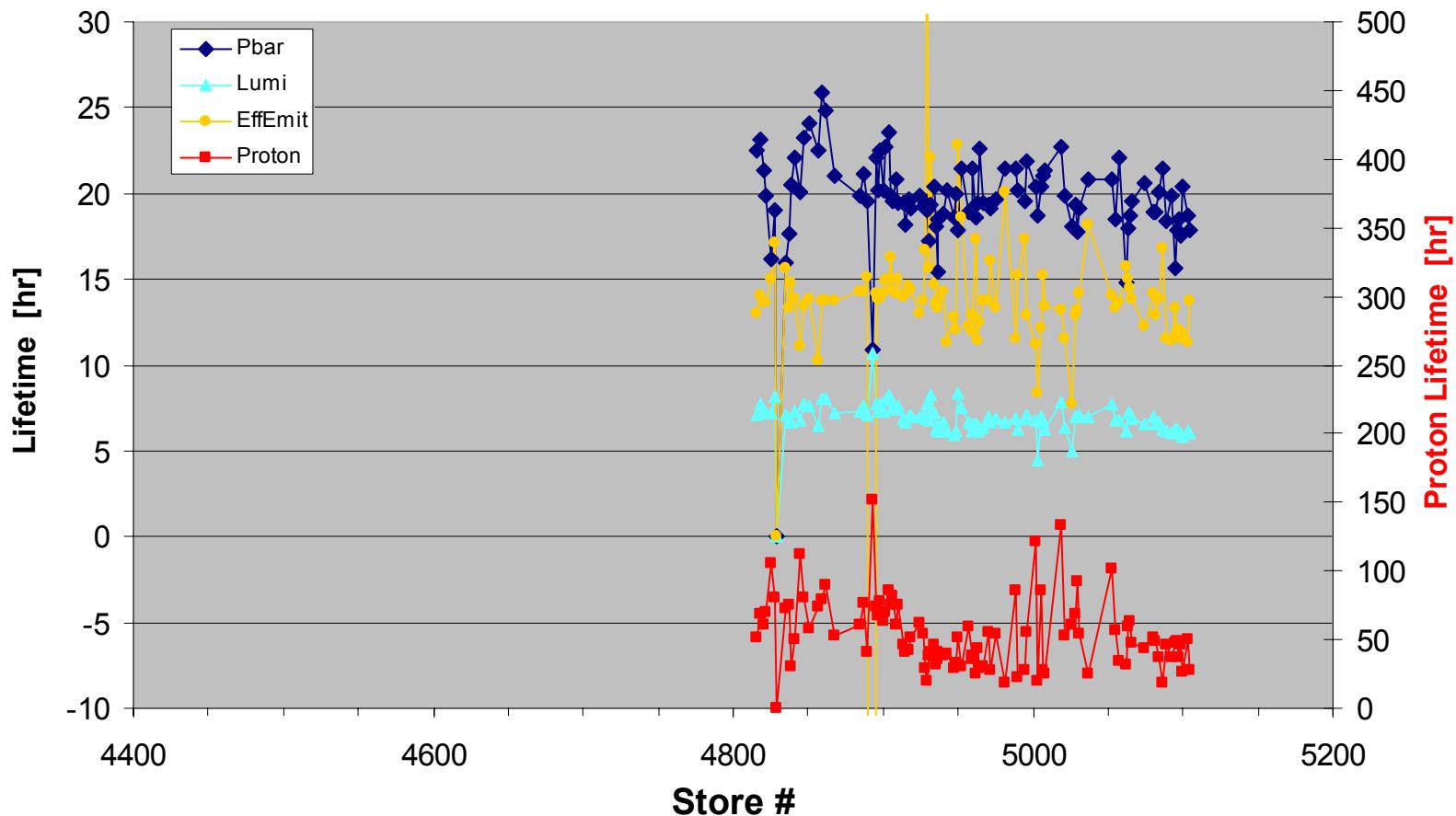


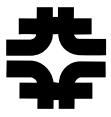
	β_x^* (cm)	β_y^* (cm)	
CDF	28.5	35.0	$\pm 10\%$
D0	27.1	35.5	$\pm 10\%$



Luminosity Lifetime

Lifetimes over First 2 Hours of HEP
Last 100 Stores

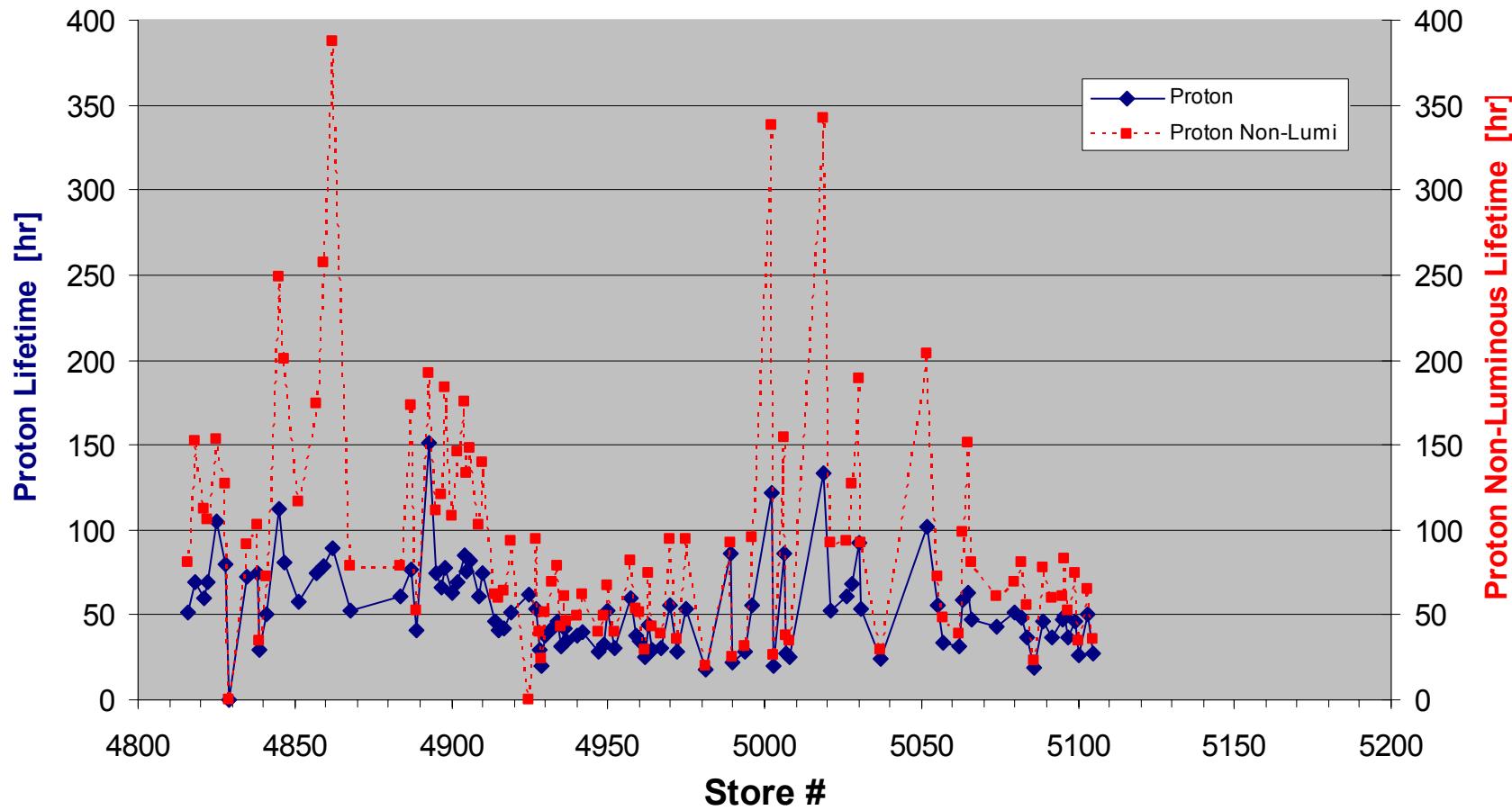


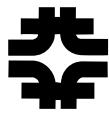


Proton Non-Luminous Lifetime

Lifetimes over First 2 Hours of HEP

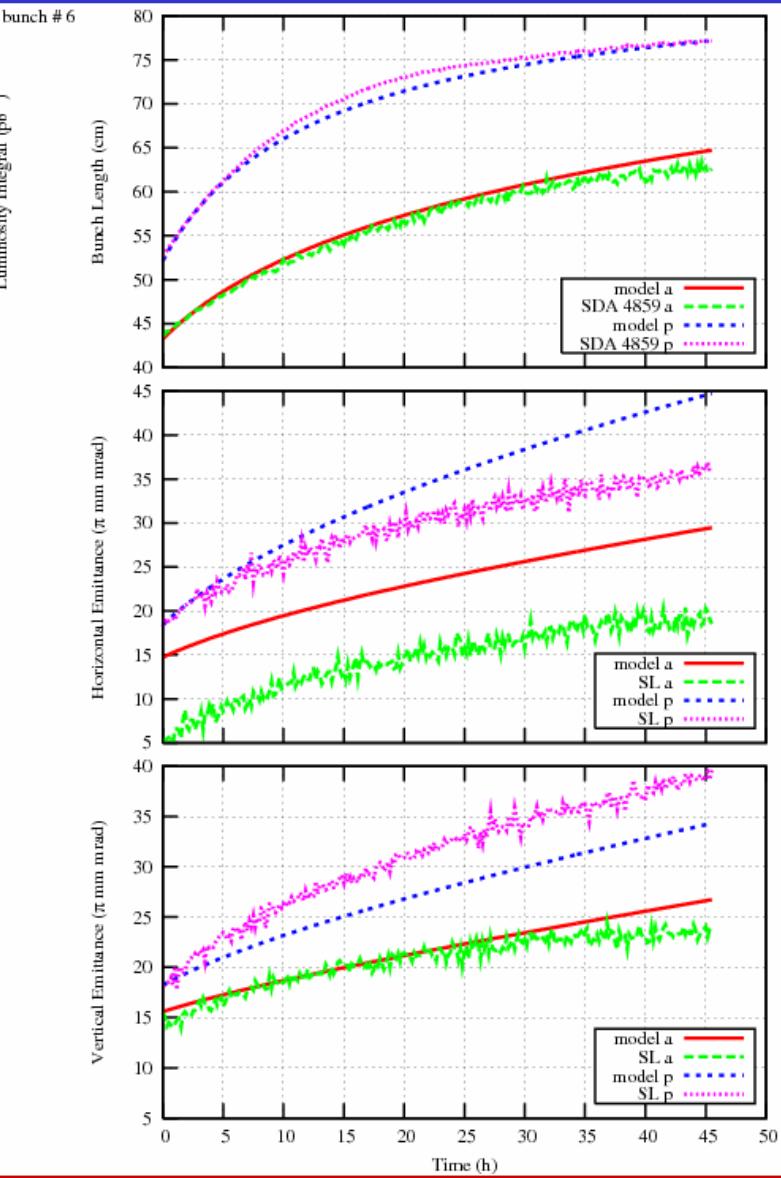
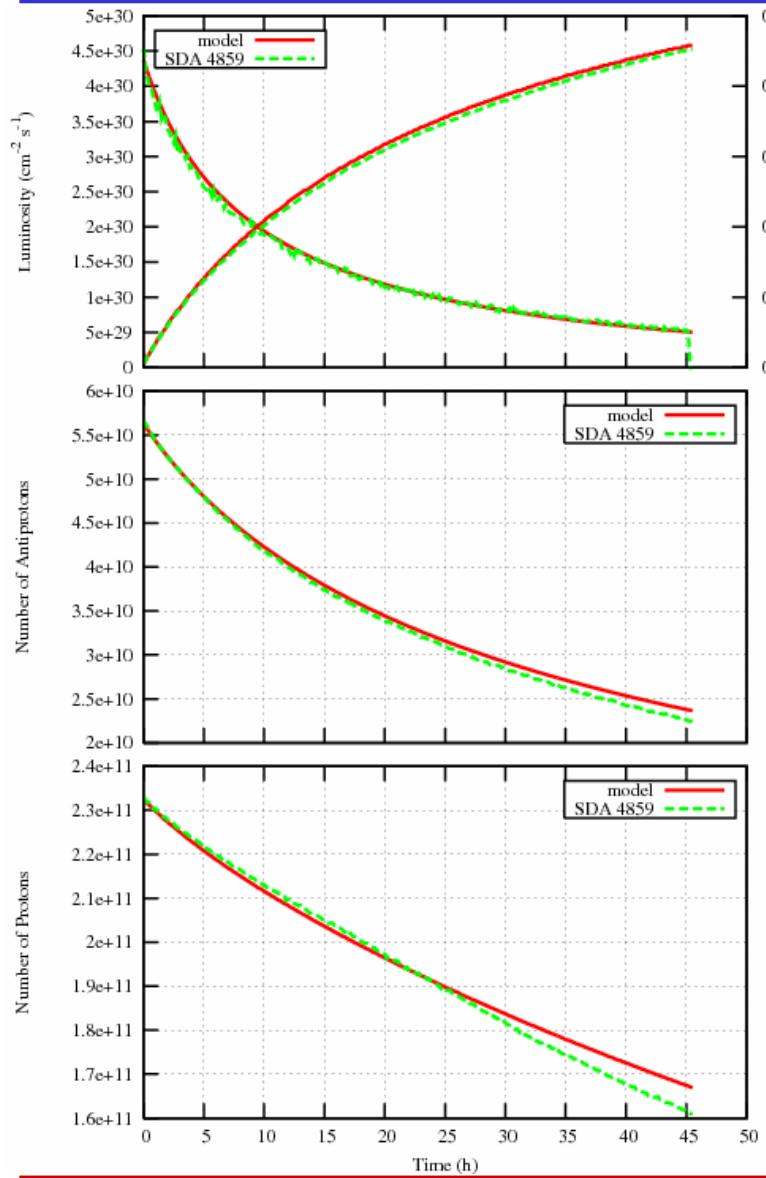
Last 100 Stores

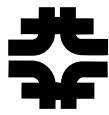




Luminosity Evolution

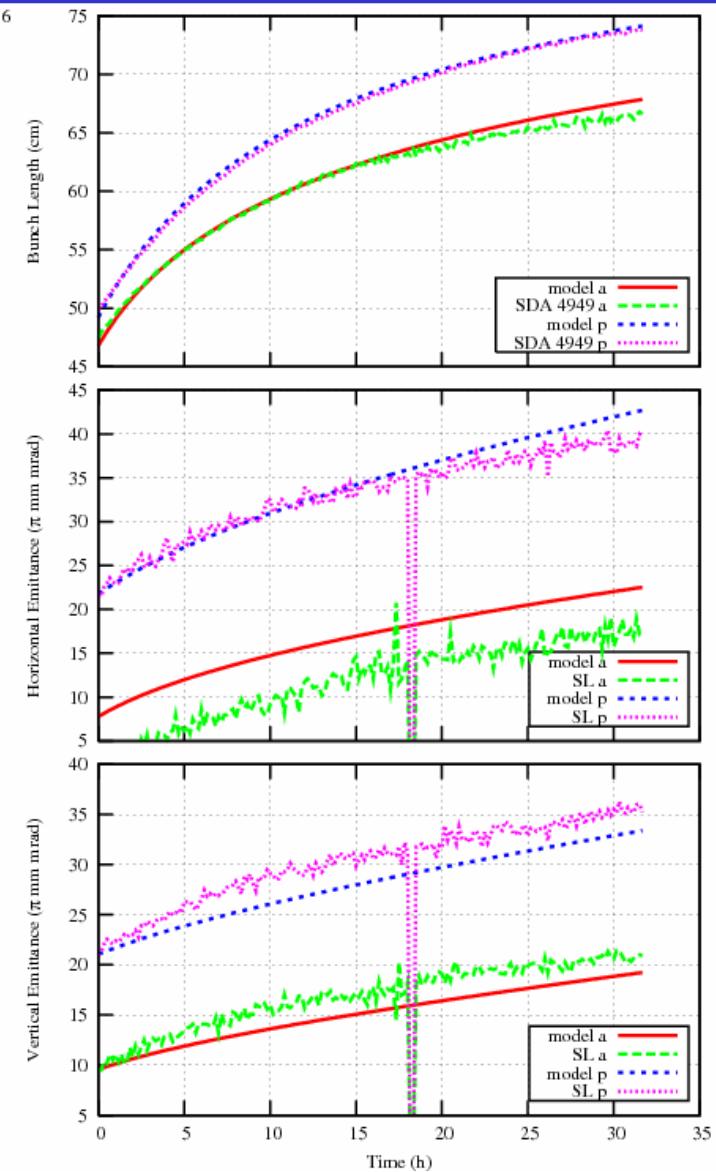
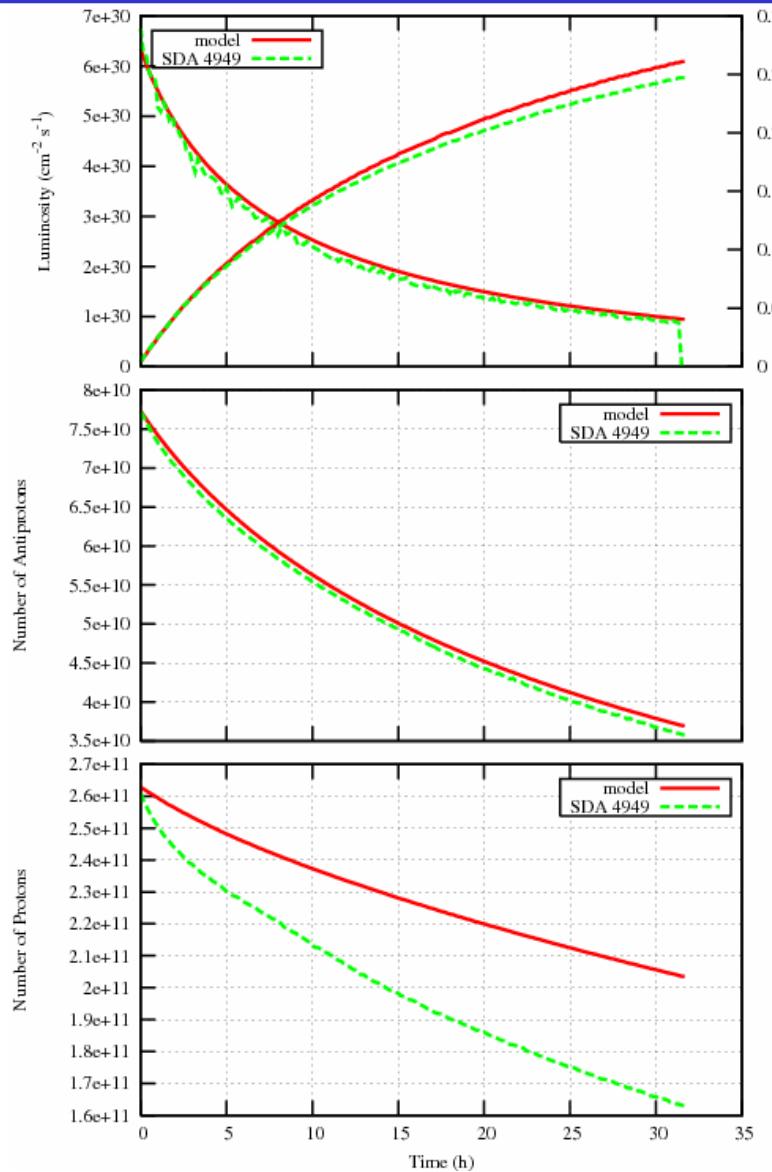
Store 4859, L=170





Luminosity Evolution

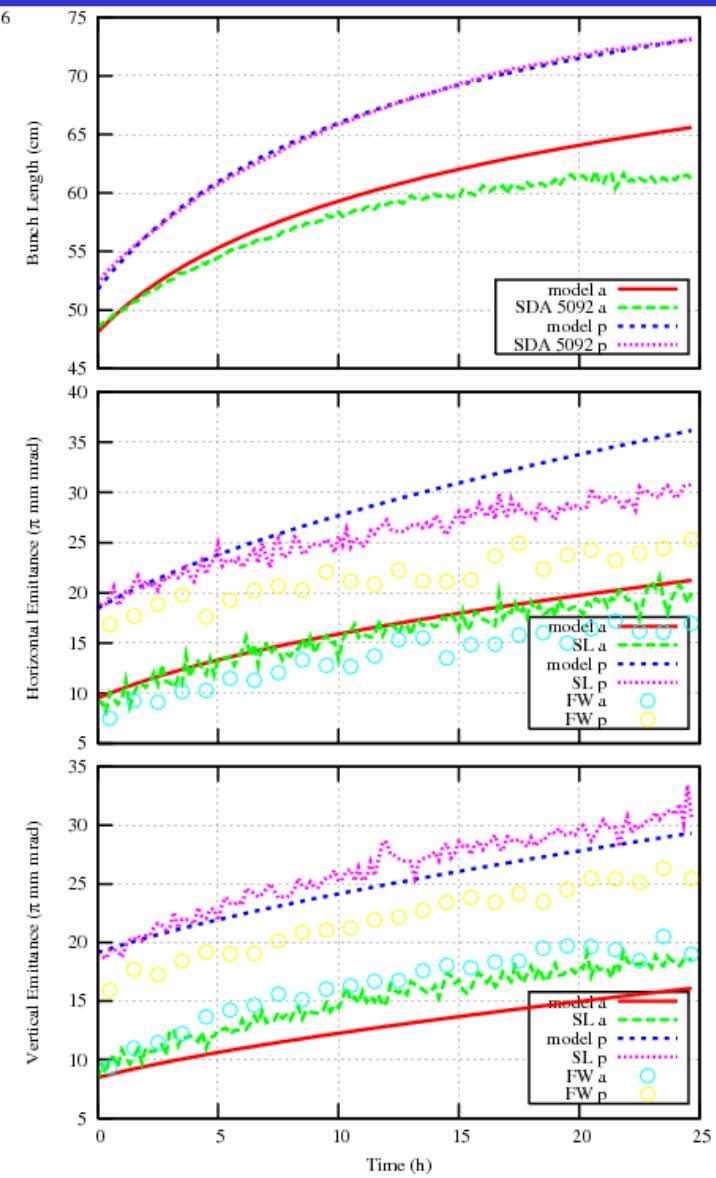
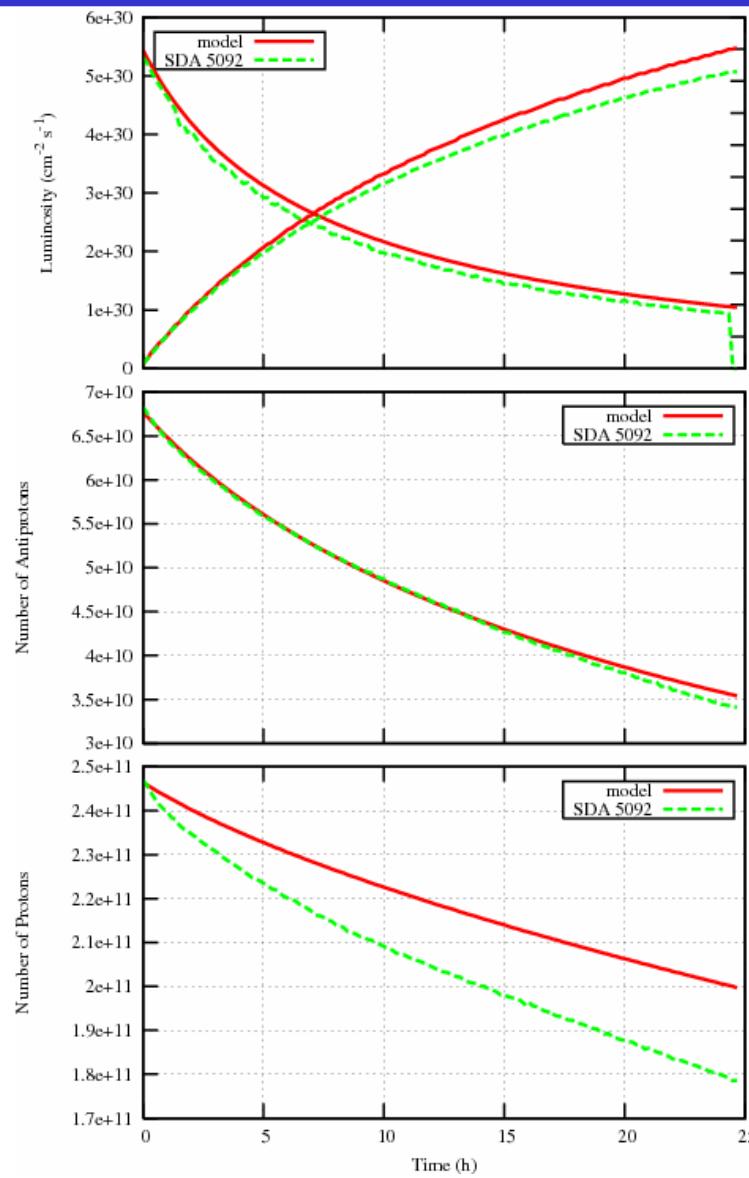
Store 4949, L=228





Luminosity Evolution

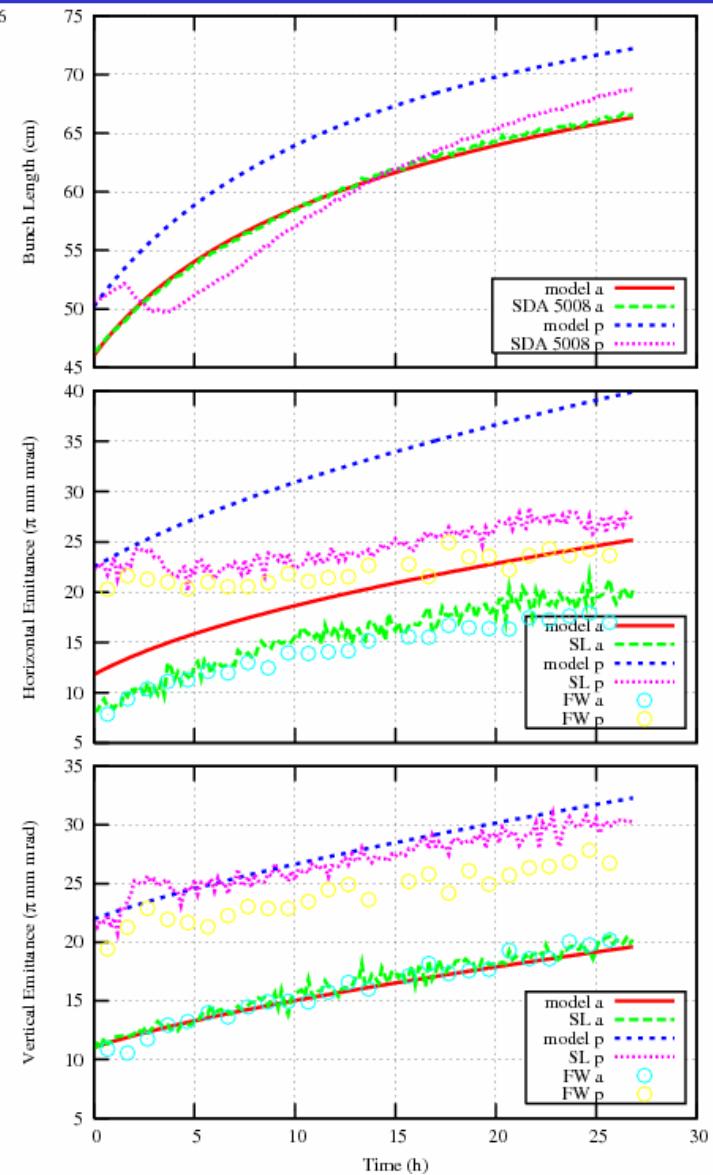
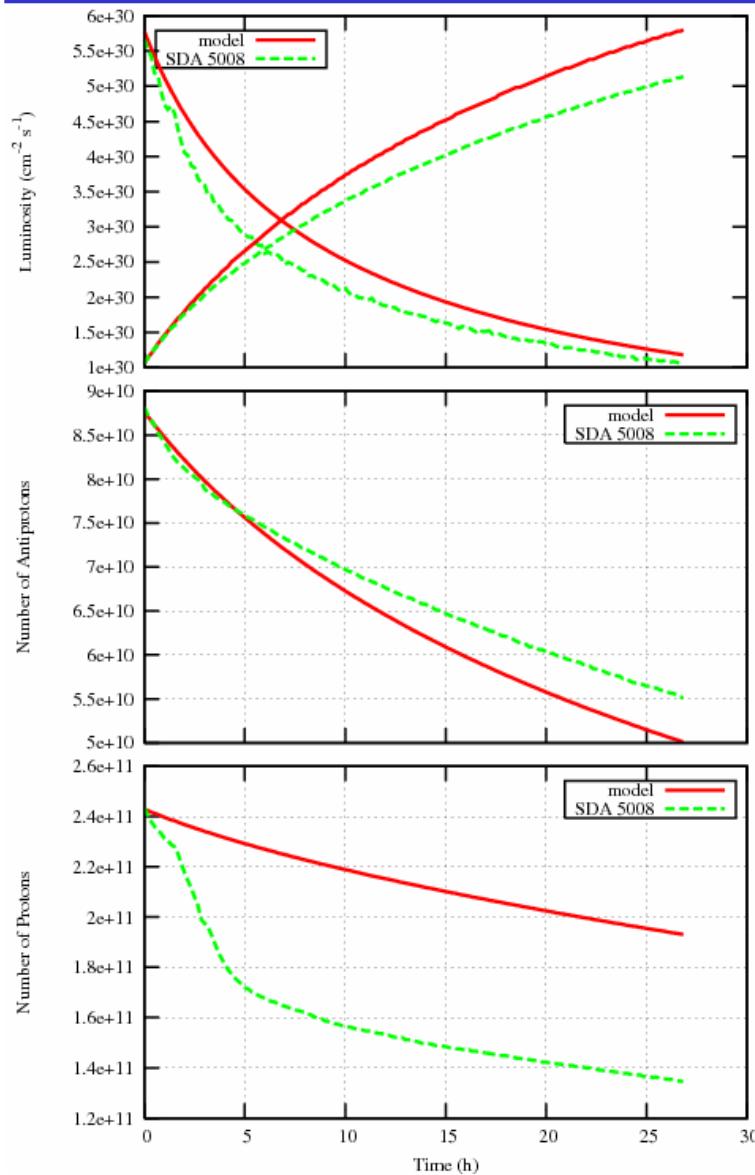
Store 5092, L=221

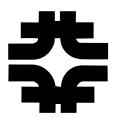




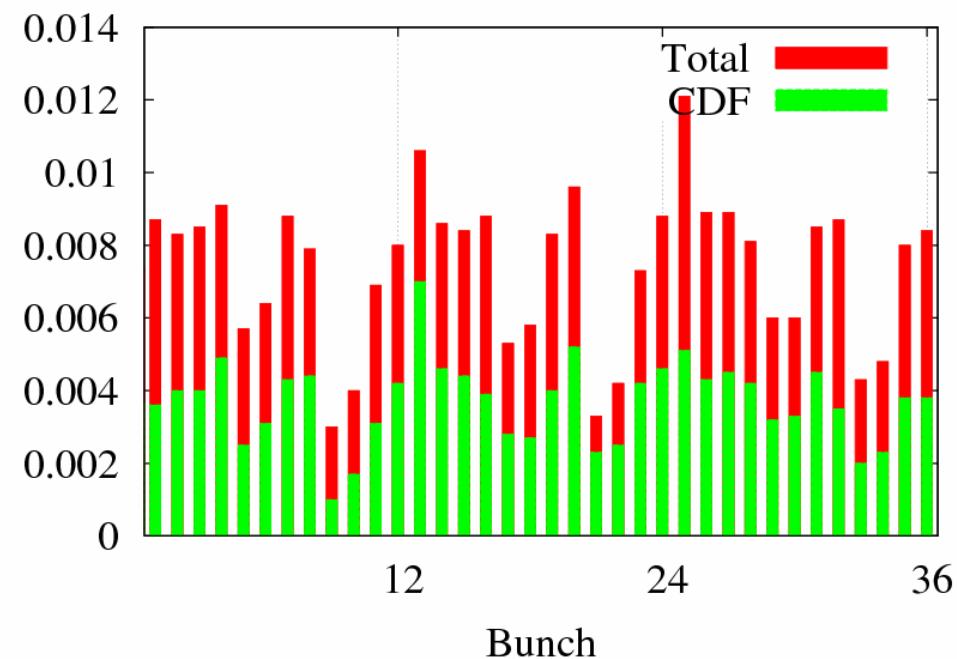
Luminosity Evolution

Store 5008, L=207

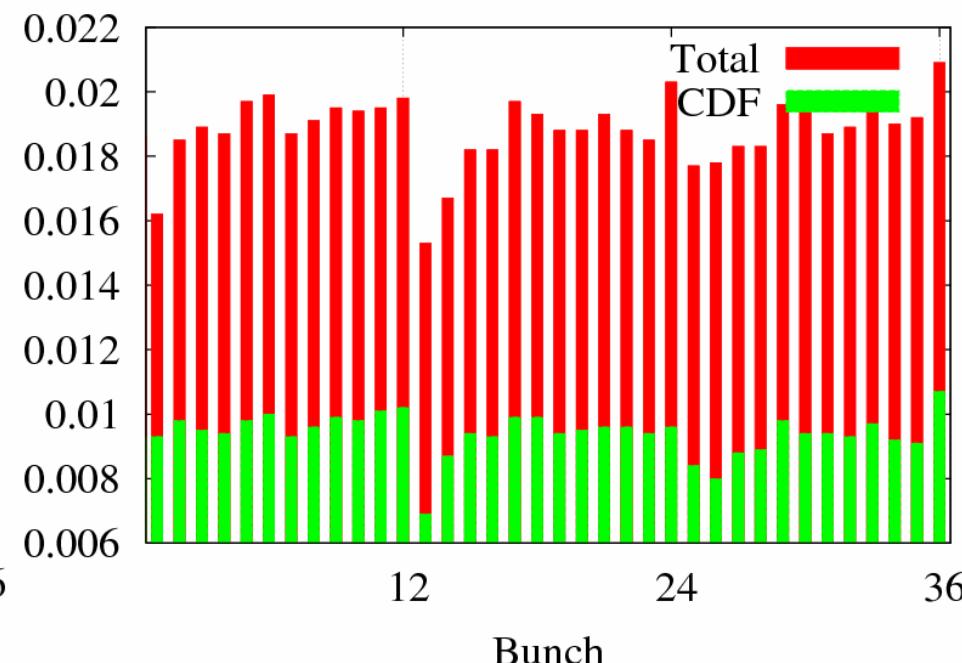


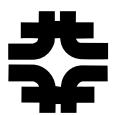


Protons Vertical

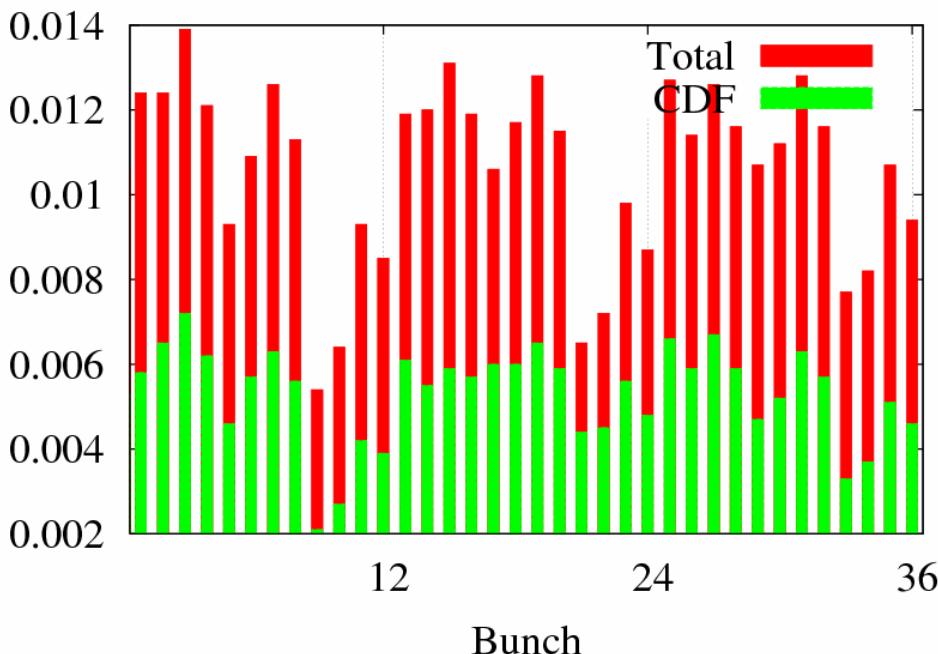


Antiprotons Vertical

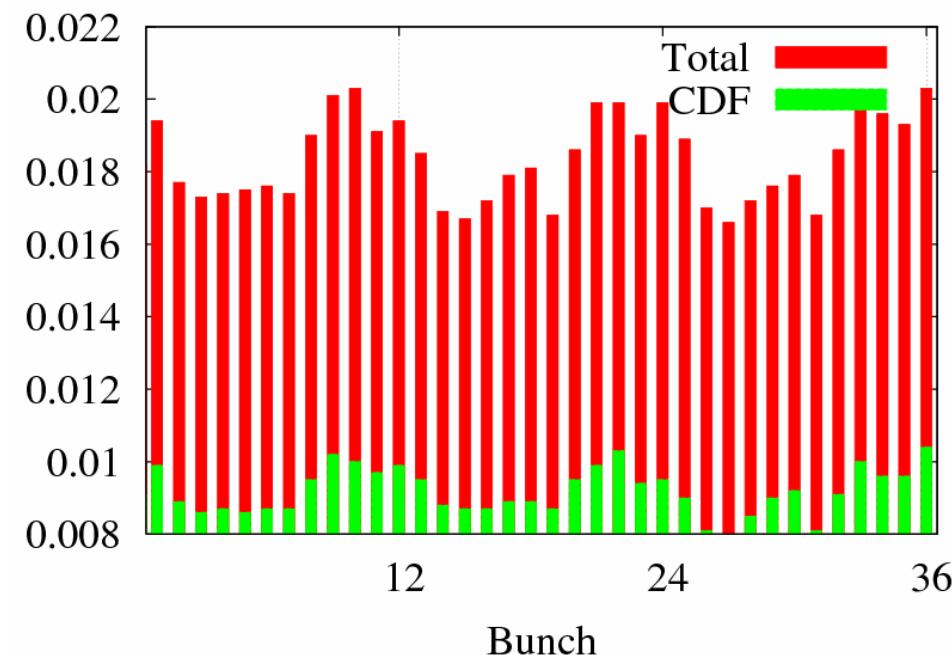


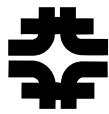


Protons Vertical



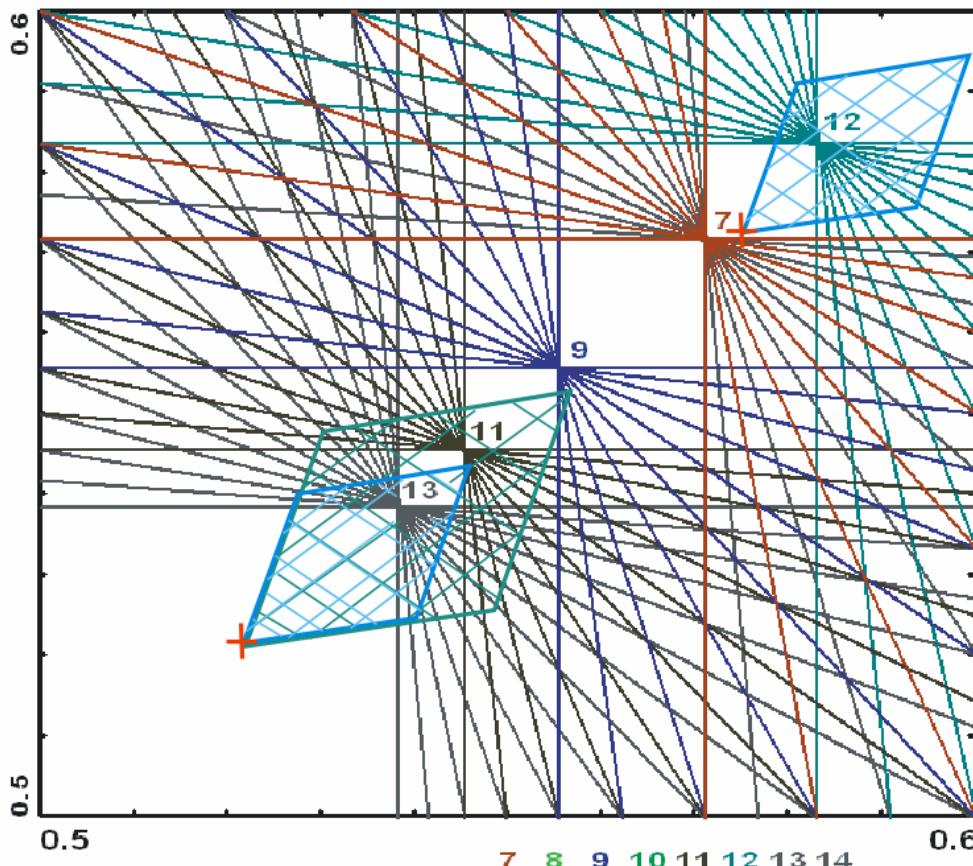
Antiprotons Vertical



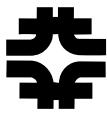


New Tevatron Working Point

- Currently operating between 4/7 and 3/5 with beam-beam $\xi_a = 0.02$
- To increase number of protons need more tune space - WP near $\frac{1}{2}$ should allow 40% more!

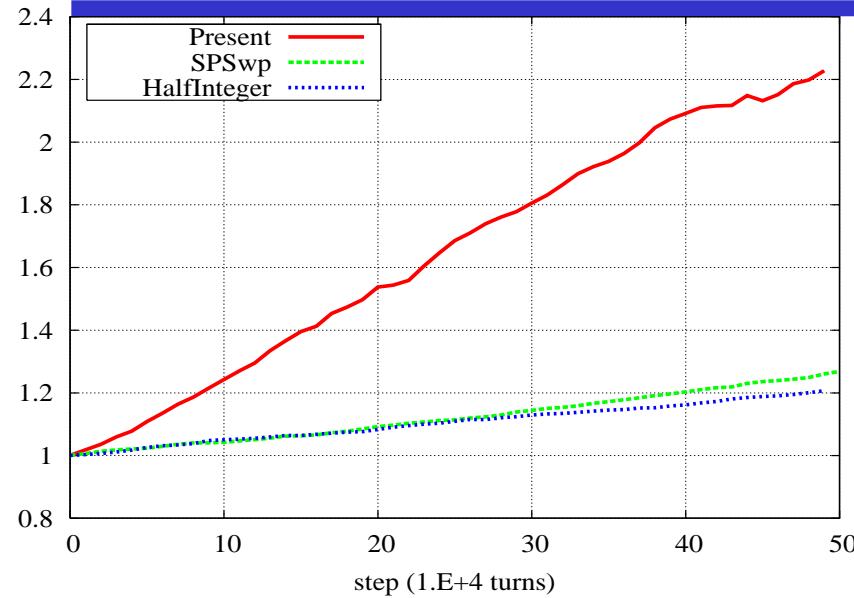


- However, vicinity of half-integer increases sensitivity to quadrupole errors, especially chromatic

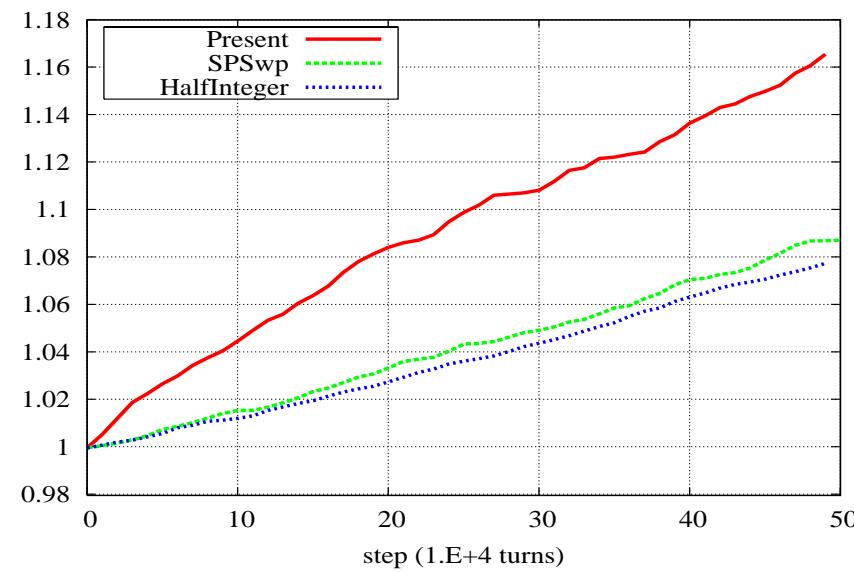


Beam-Beam Simulation: $\xi\alpha=0.026$ (30% increase)

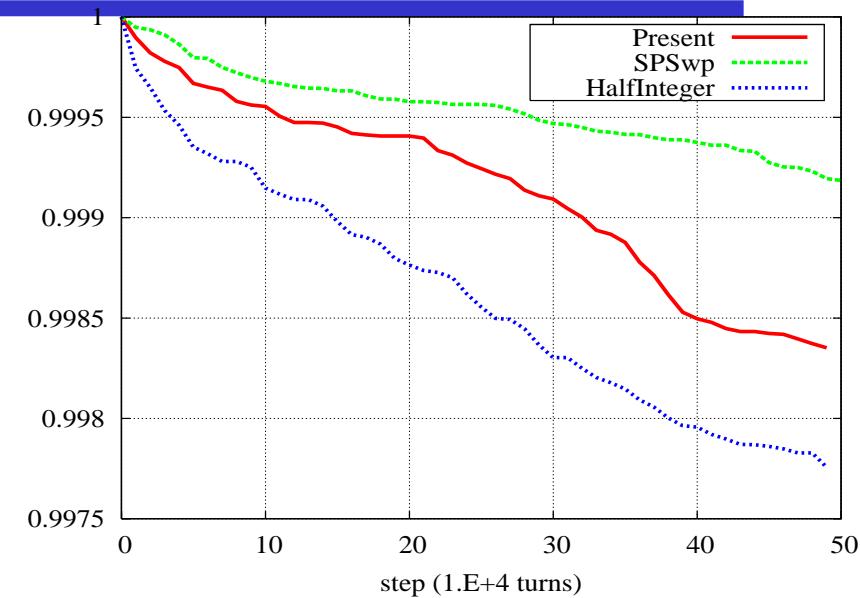
Relative Horizontal Emittance



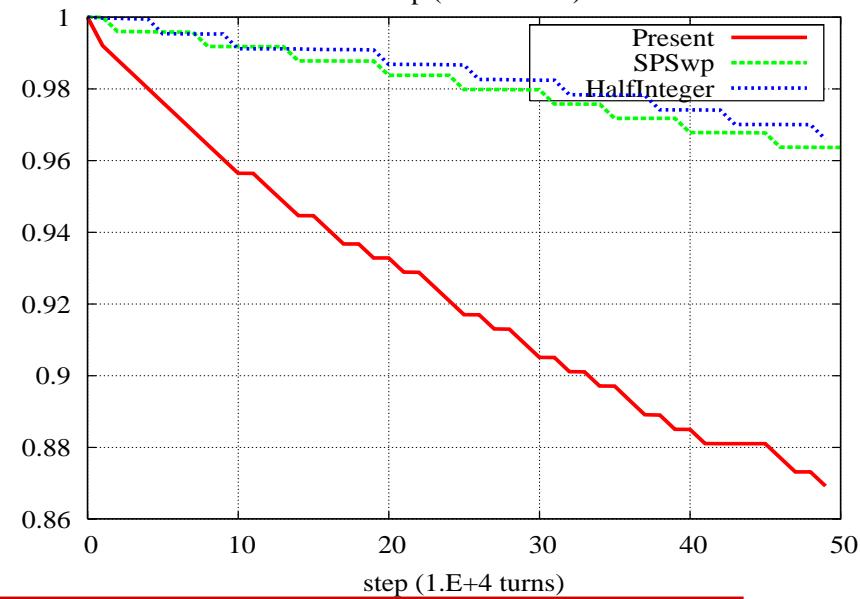
Relative Vertical Emittance

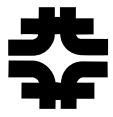


Normalized Beam Intensity



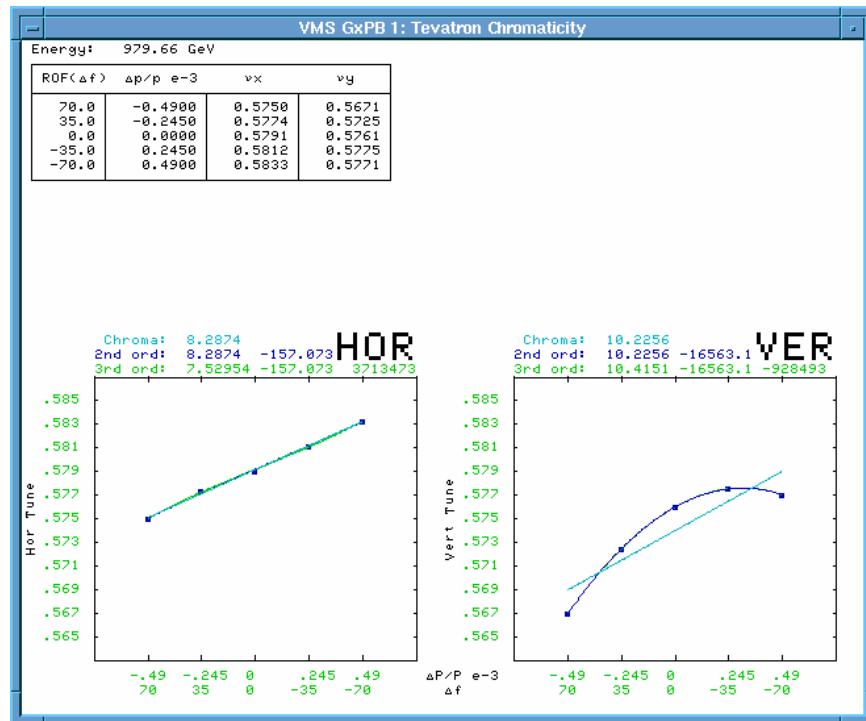
Luminosity



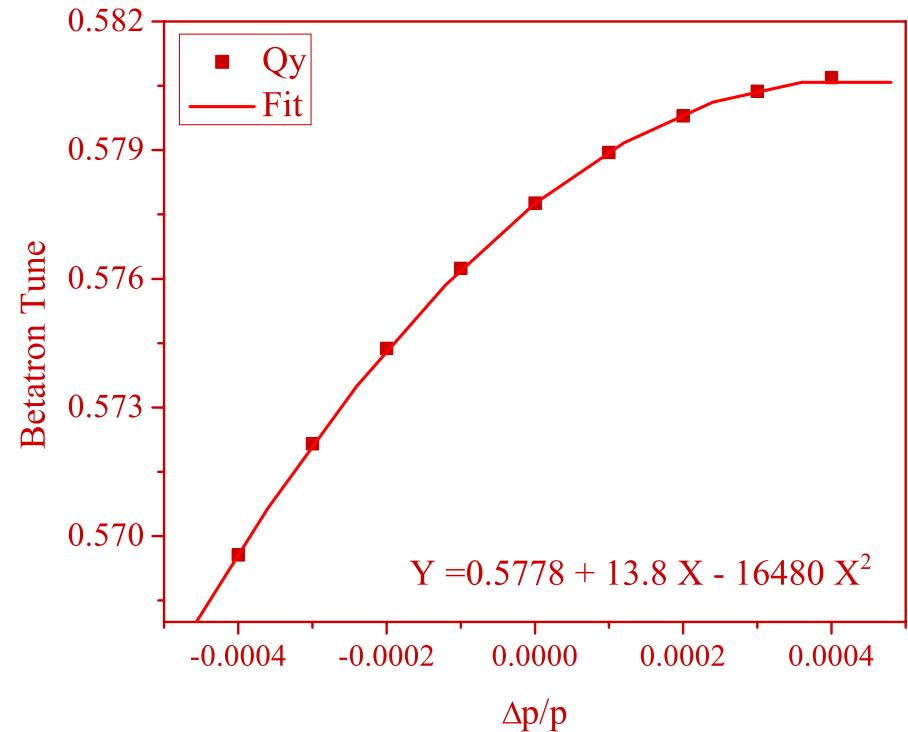


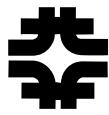
Second Order Tune Chromaticity

Measured $C_2 = -16560$



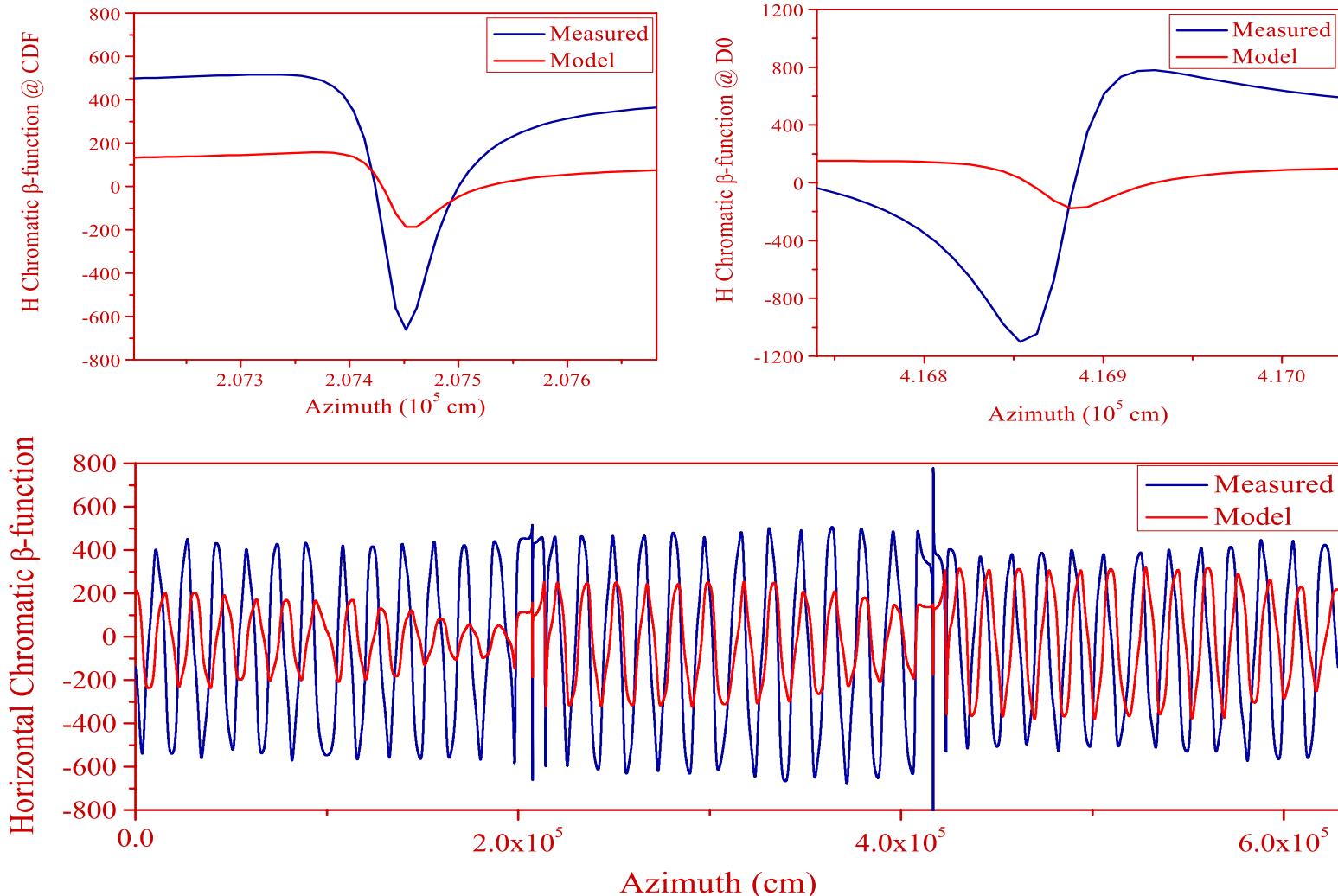
Model $C_2 = -16480$

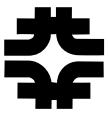




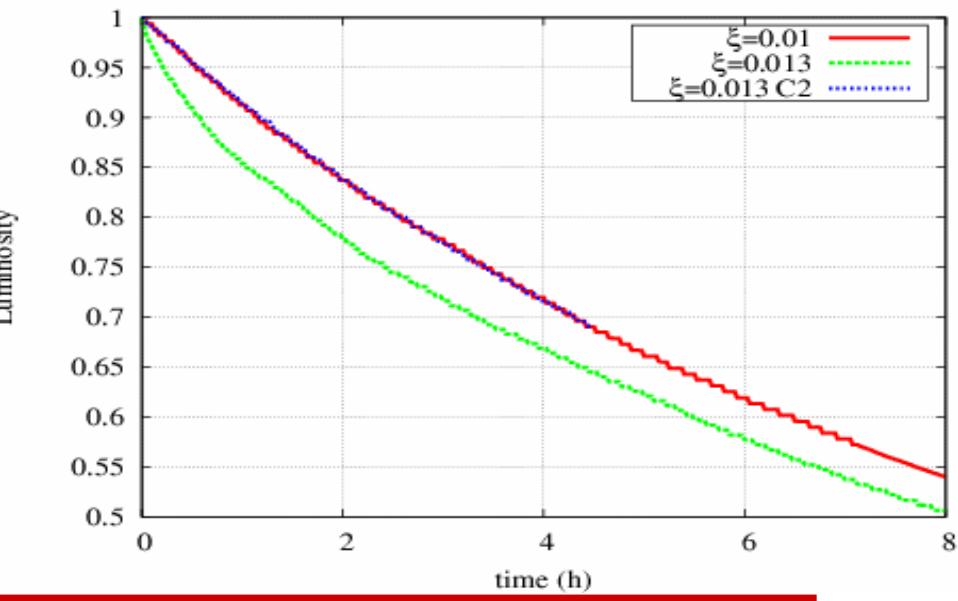
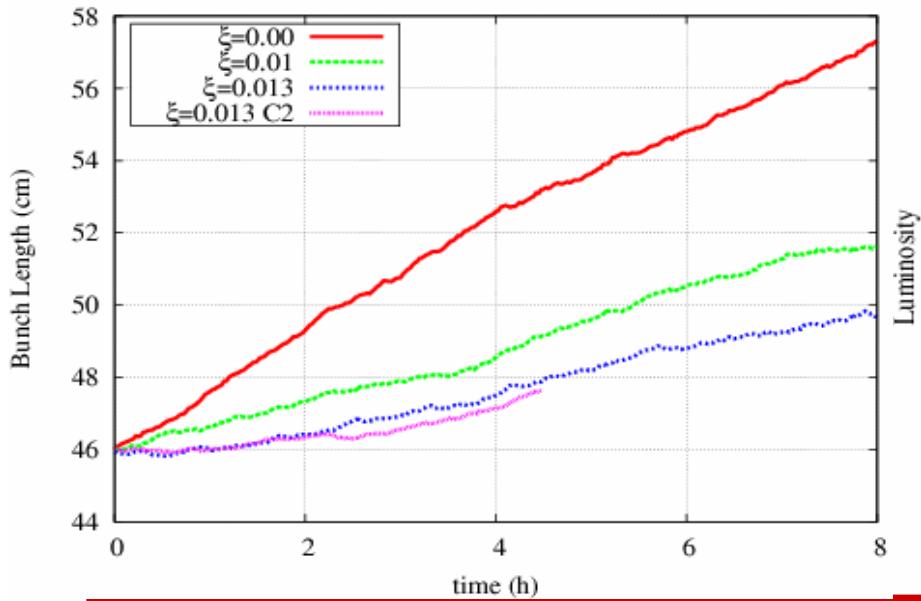
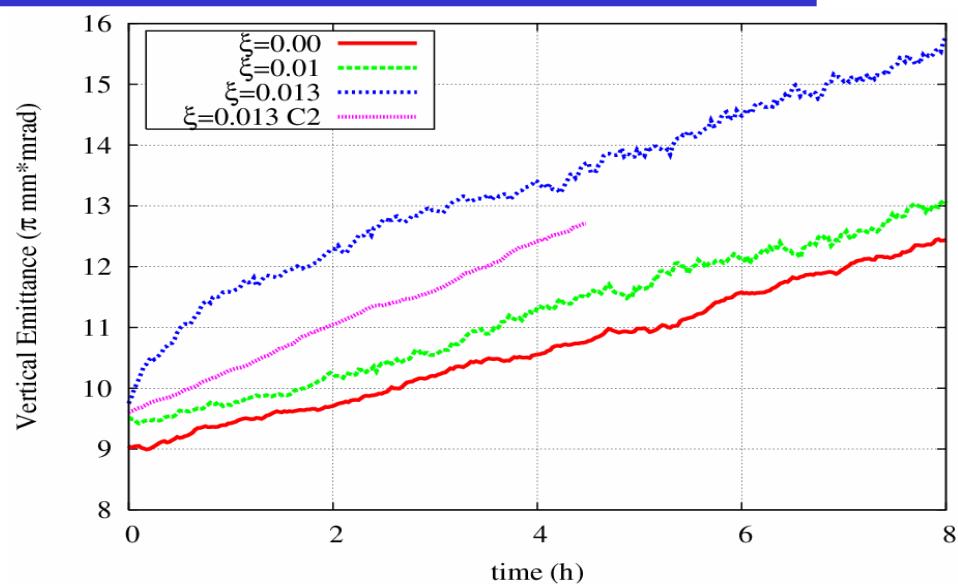
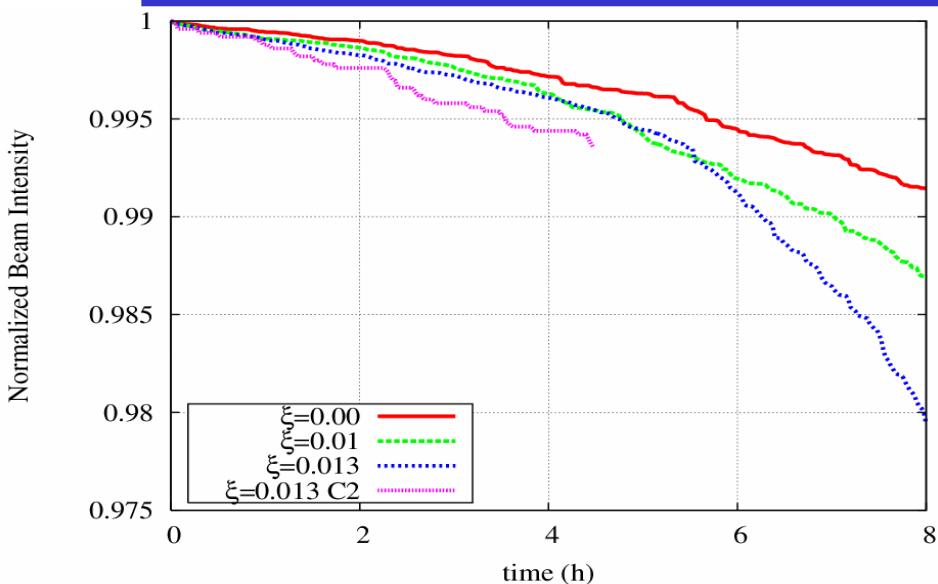
Correction of β -function Chromaticity

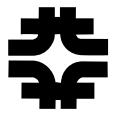
- Reconnection of sextupoles into new families





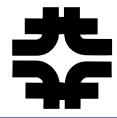
Beam-Beam Simulation: Effect of Corrected C2



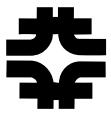


Prospects

- Fix proton injection line matching
- Gradually increase proton intensity
- Implement C2 correction
 - SD and SF circuits are split into 3 each
 - Cables for new circuits have been pulled during shutdown
 - Power supplies are being installed and tested
 - Controls software modifications $\frac{1}{2}$ done
 - Beam studies to begin in ~ January
 - Operate the new circuits in present configuration
 - Operate the new circuits at zero current at Injection
 - Propagate changes up to LowBeta



Extra slides



Beam-Beam Simulation for Protons

